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ABSTRACT

Research on sex differences in children's achievement orientations has suggested that girls have less confidence in their ability than boys, especially among bright children. To examine how sex differences in achievement orientation vary across achievement levels, 250 fifth grade children completed a questionnaire which assessed their preference for intellectual challenge. Several weeks later, each child was individually administered a discrimination-learning task to determine whether the child maintained, improved, or showed a deterioration in problem-solving strategies when confronted with insoluble problems. Children were divided into four achievement levels, according to their grade point average. Results showed that for the "A" students, significant sex differences emerged in the predicted direction. Girls were significantly less likely than boys to prefer challenging tasks; and significantly more likely than boys to show a deterioration in their performance when they confronted insoluable problems. In contrast, there were no significant sex differences within any of the other achievement levels. These findings have implications for understanding why sex differences in achievement orientations emerge in some studies, but not in others. (Author/JAC)

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Sex Differences in Achievement Orientations:

An "A" Student Phenomenon

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ABSTRACT

The purpose of the present study was to examine how sex differences in achievement orientations varied across achievement levels. Approximately 250 fifth grade children were administered a questionnaire which assessed their preference for intellectual challenge. Several weeks later, each child was individually administered a discrimination-learning task, which enabled us to determine whether the child maintained, improved, or showed a deterioration in his/her problem-solving strategies when he/she confronted insoluble problems.

Children were divided into four achievement levels, according to their grade point average (GPA). When we examined the "A" students, significant sex differences emerged in the predicted direction. Girls were significantly less likely than boys to prefer challenging tasks; and girls were significantly more likely than boys to show a deterioration in their performance when they confronted insoluble problems. In contrast, there were no significant sex differences within any of the other achievement levels. These findings have implications for understanding why sex differences in achievement orientations emerge in some studies, but not in others. Further, these findings may help us understand why there are fewer mathematically gifted girls than boys.

A considerable body of research has examined sex differences in children's achievement orientations. The general pattern that emerges is that girls have less confidence than do boys in their ability to succeed on challenging intellectual tasks. When children are asked to predict their performances on novel tasks, girls tend to underestimate their chances of success, whereas boys often overestimate theirs. Sex differences also emerge when children are asked to explain their successes and failures. Girls are more likely than boys to attribute their difficulties to insufficient ability, whereas boys are more likely to attribute their difficulties to insufficient effort. Similarly, girls are less likely than boys to attribute their successes to their abilities. The way that children respond when actually confronted with challenging tasks is consistent with their achievement-related beliefs. That is, boys are more likely than girls to chose difficult tasks over easy ones, and girls are more likely than boys to show a deterioration of effort when encountering difficulty (See Licht & Dweck, 1984, for review.) These sex differences, which emerge in the early school years, are somewhat surprising in light of the fact that girls' academic achievements are at least as high as those of boys during elementary school.

When sex differences are reported, they are consistently in the direction described above. However, they are not always found. Some research is emerging that may shed light on one of the factors that mediates whether or not sex differences will emerge. Specifically, there are data to suggest that these sex differences may be most pronounced among bright children. That

is, it may actually be some of the brightest girls who have the shakiest confidence and, thus, show the most deterioration of performance in the face of difficulty. For example, Crandall, Katkovsky and Preston, (1962) and Stipek & Hoffman (1980) found a surprising tendency for girls' expectations of success on a novel intellectual task to be negatively related to their previous levels of academic achievement. The expectancies of boys, however, were positively related to their academic achievements. Similarly, Licht & Shapiro (1982) found that sex differences in causal attributions (with girls being more likely than boys to attribute their difficulties to insufficient ability) emerged only among the "A" students.

The purpose of the present investigation was to more fully explore how sex differences in achievement orientations vary across achievement levels. The achievement-orientation variables that we examined were: 1) The children's preference for challenge (i.e., the degree to which the children said they prefer safe, familiar tasks versus more challenging tasks), and 2) How children actually performed when presented with a very challenging intellectual task (i.e., the degree to children maintained, increased, or decreased the quality of their problem-solving strategies when they confronted insoluble problems).

METHODS

Approximately 240 fifth grade children participated in this study. These subjects included all of the fifth graders at two public schools whose parents returned permission slips (over 90% return rate). These two particular schools were chosen because of their relatively high achievement records. That is, we wanted to be sure that we obtained a sufficiently large sampling of high achieving children. This study was part of a larger scale investigation of children's achievement orientations, and only those procedures that are relevant to the present study will be described.

Questionnaire. A self-report questionnaire was administered to all the children in their regular classrooms during a 50-minute session. Although the questionnaire was designed to tap a variety of achievement orientation variables, the subscale most central to this presentation concerns children's "preference for challenge." This subscale consisted of three forced-choice questions designed to determine whether the children preferred to work on safe, familiar tasks or more challenging tasks (e.g., "It's more fun to work on a subject that I know I'm good at than to try a subject that is more difficult for me" versus "It's more fun to work on a subject that is more difficult for me."). Other subscales or items that are briefly discussed later include test anxiety, causal attributions for successes and failures, and children's assessments of how intelligent they thought they were. For the latter measure, children were presented with a column of 25 stick figures representing the children in their homeroom

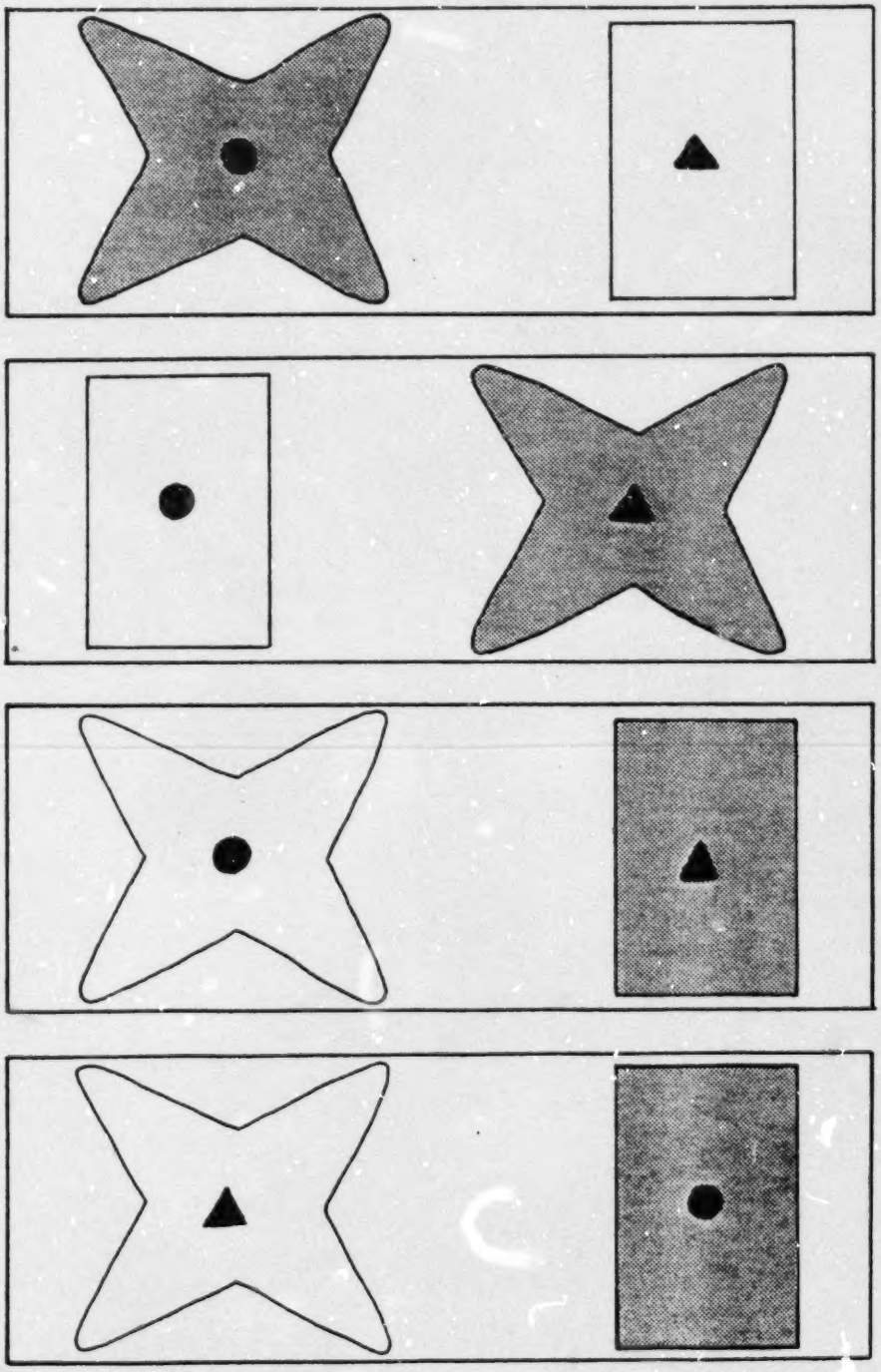
class, and they were asked to mark the figure that showed how smart they were compared to the other children in their class.

Discrimination-Learning Task. A few weeks later, each child was individually administered (during a 30-50 minute session) a discrimination-learning task (Dienor & Dweck, 1978; Levine, 1966) by a female experimenter. The task consisted of six "training" problems, followed by four "test" problems. The training problems, as the name implies, were designed to train the children how to solve the problems. Sufficient hints were given on these problems to insure that they were all solved correctly. The four "test" problems looked identical to the training problems, but they were all insoluble.

Each discrimination-learning problem consisted of 16 or 20 cards, each of which contained two colors, two large outside shapes, and two smaller inside shapes. To illustrate, figure 1 presents four cards from one of the problems. As you can see, within a given problem, the same colors and shapes are presented on each card, although the arrangement of stimuli differs across cards. For each problem, the children were told that the experimenter was thinking of one of the six things on the cards, and the child's task was to figure out which one the experimenter was thinking of. The cards were then presented to the child one at a time. For each card, the child pointed to the side that he/she thought contained the correct answer, and the experimenter would say "correct" or "wrong" to indicate whether the side to which the child pointed did or did not contain the correct answer. For the four test problems, the experimenter said "wrong" regardless of the side to which the child pointed.

Figure 1

Sequence of Four Cards from Discrimination-Learning Task



Task developed by Levine (1966). Adapted by Diener and Dweck (1978).

Initially, the experimenter gave this feedback after every card. However, the feedback was faded so that by the 5th training problem, the experimenter only gave feedback after every four cards. Research shows that when the child does not receive feedback, he/she will maintain his guess until the experimenter gives feedback which contradicts that guess. By having the child point four times before new feedback was given, we were able to determine which of the six stimuli the child was guessing at that point in the problem. Then, by examining the child's sequence of guesses, we were able to categorize the type of problem-solving strategy that the child was employing on each of the problems. The method used for categorizing strategies was adapted from Diener & Dweck (1978). These strategies were classified into one of three categories: no useful strategy, "hypothesis checking" (a lower level strategy), and "dimension checking" (a higher level strategy).

The first test problem was considered to be a measure of the child's problem-solving strategy <u>prior</u> to confronting difficulty since it was not until the problem was finished that the child realized that he/she failed to solve the problem. We then examined whether children's problem-solving strategies improved, stayed the same, or deteriorated over the course of the remaining test problems. (Careful debriefing procedures were employed to insure that the children left the situation feeling that they had performed very well.)

RESULTS

After completion of data collection, the children were divided into four achievement levels, according to their grade point average (GPA). Sex differences were then examined within each of the four GPA levels.

Division into 4 achievement levels. The four achievement levels were based on the average of their grades in reading, math, written language, and spelling. Although these schools did not give letter grades in these subjects, they did code the children's grades in a way that could be easily translated into the more familiar grades of A, B, C, and D. Those who were regularly performing below grade level were eliminated from the analyses.

Sex differences in children's preference for challenge. Within each of the four achievement levels, we analyzed for sex differences in preference for challenge. As one can see in Table 1, significant sex differences emerged only among the "A" students. As expected, high achieving boys were more likely than high achieving girls to say they prefer challenging tasks over safe, familiar tasks. In the next series of analyses, we examined how children actually responded when confronted with a challenging task.

Sex differences in response to insoluble problems. Within each of the four achievement levels, we compared boys and girls in terms of how their performance changed across the four test problems. As indicated earlier, performance on the first test problem is best seen as a measure of children's "baseline"

performance--that is, how they perform prior to confronting difficulty. Thus, a child was considered to have shown a deterioration in performance in the face of difficulty if his/her performance on the last test problem was lower than his/her performance on the first test problem.

For each child, a deterioration score was computed. Children were assigned a score of "0" if they were using the same problem solving strategy on the first and last test problems. A score of "+1" means that the child's performance was higher on the last test problem than on the first. A score of "-1" means that the child's performance on the last test problem was one level lower than it was on the first problem; and a score of "-2" means that their performance on the last problem was two levels lower than it was on the first.

Within each of the four achievement levels, we examined sex differences in children's deterioration scores. As one can see in Table 2, it was only among the "A" students that a significant sex difference emerged. Whereas 21% of the males showed a deterioration in performance from the first to the last test problem, 41% of the females showed deterioration. Likewise, 25% of the males showed some improvement, whereas 15% of the females did so.

In order to obtain a more complete picture of the sex differences that emerged among the "A" students, Table 3 presents the performances of male and female "A" students on each of the four test problems. As one can see from the table, the performances of males and females were virtually identical on the

first test problem. If anything, girls performed slightly better. Unexpectedly, the boys showed a noticeable drop in performance immediately following the first test problem (problem 2). However, they showed an immediate and complete recovery (problem 3); and they maintained their strategies on the last problem. Thus, after experiencing three unsolved problems, the high-achieving boys, as a group, were performing at least as well as they had done prior to confronting difficulty. In contrast, the high achieving girls showed a very different pattern. The drop in performance that they showed on the second problem was relatively small in magnitude. However, the deterioration in performance continued on each successive problem. Thus, by the last test problem, the high achieving girls were performing significantly more poorly than they were capable of doing.

Children within each of the other three achievement levels were also examined in the manner just described (i.e., sex differences on each test problem) in order to determine whether any sex differences emerged that were not uncovered by analyses of the debilitation scores (which only considered the first and the last test problems.) The only findings of potential interest involve the "D" students; and these data are presented in Table 4. Similar to the "A" students, the male and female "D" students started out with nearly equivalent performances. However, the girls drop noticeably immediately following the first test problem, while the boys improve slightly. The result is that the boys are performing significantly better than girls on test problem 2. Although the girls recover somewhat on problem 3, they seem to deteriorate again on problem 4. However, the sex

difference on the last problem was not significant nor, as indicated earlier, were the sex differences in debilitation scores. It should be noted, however, that since there were fewer "D" students than in any of the other achievement levels, the statistical tests conducted on this group were less powerful than those conducted the other groups. Thus, it is possible that had there been more "D" students, there would have been more significant findings for this group.

Taken together, the data presented suggest that the clearest pattern of sex differences seems to exist among the "A" students. However, some sex differences may also exist among the very low achieving students.

DISCUSSION

As predicted, the tendency for girls to be less confident in their abilities than boys emerged most clearly among the "A" students. Bright girls were significantly less likely than bright boys to prefer challenging tasks; and when actually confronted with challenge, bright girls were significantly more likely to show a deterioration of their problem-solving strategies.

Interestingly, when children were directly asked to give an assessment of how smart they thought they were (as described in Methods), there were virtually no sex differences within any of the four achievement levels. Thus, while bright girls have less confidence in their abilities than do bright boys, it is not the case that these girls think they are stupid. Rather, it appears that bright girls think that they are bright, but they are not very confident about this. Consequently, they prefer not to put their abilities to any real test (i.e., they prefer safe, familiar tasks to novel, challenging ones). And when their abilities are put to the test, as, for example, when they confronted the four "test" problems, bright girls are not confident enough to withstand the pressure. Consequently, they do not perform as well as they are capable of doing.

It should also be noted that although these findings suggest that the clearest pattern of sex differences seems to exist for the "A" students, this is not to imply that it is only among the "A" students that girls show <u>any</u> vulnerability. First, as indicated earlier, there was a trend (albeit nonsignificant) among the "D" students for girls to show a greater deterioration of performance in the face of difficulty (see also Licht,

Kistner, Ozkaragoz, Shapiro, & Clauson, 1984). Second, analyses of some other achievement orientation variables suggest that there may be some sex differences within the other achievement levels. Specifically, analyses of the test anxiety subscale revealed significant sex differences among the "A", "B", and "C" students. Likewise, the causal attribution questions revealed some sex differences (in the usual direction) among the "C" students as well as the "A" students (although on these attribution questions, the sex differences were not particularly clear within any of the achievement levels.) Thus, taken together, these findings suggest that sex differences in children's achievement orientations may occur, to some degree, at most achievement levels; but by far the clearest pattern emerges among the "A" students.

These findings have implications for understanding why sex differences in achievement orientations may emerge in some studies, but not in others. That is, sex differences should be most likely to emerge in high achieving and/or high S.E.S. samples (see Nicholls, 1980). Further, these findings may help us understand why girls do more poorly than boys in mathematics. That is, although sex differences in mathematics are generally small in magnitude when they are reported for the entire population considered together, sex differences among mathematically gifted children tend to be large (Benbow & Stanley, 1980). Perhaps if bright girls had more adaptive achievement orientations, they would do better when they confronted challenging mathematical problems (See Dweck & Licht, 1980 for discussion).

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TABLE 1

SEX DIFFERENCES IN CHILDREN'S PREFERENCE FOR CHALLENGE WITHIN EACH OF 4 ACHIEVEMENT LEVELS

GPA	FEMALES	MALES	1-TAILED SIGNIFICANCE OF SEX DIFFERENCES FROM T-TESTS
A	$\bar{X}$ = 1.22 N = 32	$\bar{X}$ = 1.88 N = 33	p = .002
B	$\bar{X}$ = 1.73 N = 26	$\bar{X}$ = 1.50 N = 28	p = .16
C	$\bar{X}$ = 1.40 N = 38	$\bar{X}$ = 1.53 N = 36	p = .23
D	$\bar{X}$ = 1.37 N = 19	$\bar{X}$ = 1.50 N = 16	p = .33

*PREFERENCE FOR CHALLENGE SCORES RANGE FROM 0 - 3

TABLE 2

SEX DIFFERENCES IN RESPONSE TO INSOLUBLE PROBLEMS (DETERIORATION SCORES) WITHIN EACH OF 4 ACHIEVEMENT LEVELS

GPA	DETERIORATION SCORES		FEMALES	MALES	1-TAILED SIGNIFICANCE OF SEX DIFFERENCES FROM MANN-WHITNEY U TESTS
A	IMPROVED 1 LEVEL	+1	14.8%	25.0%	$p = .049$
	NO CHANGE	0	44.4%	53.6%	
	DETERIORATED 1 LEVEL	-1	33.7%	21.4%	FEMALE $N = 27$
	DETERIORATED 2 LEVELS	-2	7.4%	0%	MALE $N = 28$
B	IMPROVED 1 LEVEL	+1	9.5%	20.0%	$p = .42$
	NO CHANGE	0	71.4%	48.0%	
	DETERIORATED 1 LEVEL	-1	19.0%	32.0%	FEMALE $N = 21$
	DETERIORATED 2 LEVELS	-2	0%	0%	MALE $N = 25$
C	IMPROVED 1 LEVEL	+1	14.8%	20.0%	$p = .24$
	NO CHANGE	0	55.6%	56.7%	
	DETERIORATED 1 LEVEL	-1	25.9%	23.3%	FEMALE $N = 27$
	DETERIORATED 2 LEVELS	-2	3.7%	0%	MALE $N = 30$
D	IMPROVED 1 LEVEL	+1	20.0%	14.3%	$p = .21$
	NO CHANGE	0	40.0%	71.4%	
	DETERIORATED 1 LEVEL	-1	40.0%	14.3%	FEMALE $N = 10$
	DETERIORATED 2 LEVELS	-2	0%	0%	MALE $N = .14$

TABLE 3

SEX DIFFERENCES AMONG THE "A" STUDENTS: CHANGE IN PROBLEM-SOLVING STRATEGIES ACROSS THE FOUR "TEST" PROBLEMS

	PROBLEM-SOLVING STRATEGY*	FEMALES	MALES	1-TAILED SIGNIFICANCE OF SEX DIFFERENCES FROM MANN-WHITNEY U TESTS
PROBLEM 1	2	25.9%	17.9%	$\underline{p}$ = .33
	1	55.6%	64.3%	
	0	18.5%	17.9%	
PROBLEM 2	2	22.2%	7.1%	$\underline{p}$ = .04 (BOYS < GIRLS) (THIS WAS NOT PREDICTED, SO 2-TAILED $\underline{p}$ MAY BE MORE APPROPRIATE HERE)
	1	55.6%	53.6%	
	0	22.2%	39.3%	
PROBLEM 3	2	11.1%	17.9%	$\underline{p}$ = .17
	1	66.7%	67.9%	
	0	22.2%	14.3%	
PROBLEM 4	2	7.4%	21.4%	$\underline{p}$ = .04 (BOYS > GIRLS)
	1	59.3%	60.7%	
	0	33.3%	17.9%	

* 2 = DIMENSION CHECKING (HIGHER LEVEL STRATEGY)
1 = HYPOTHESIS CHECKING (LOWER LEVEL STRATEGY)
0 = NO USEFUL STRATEGY

TABLE 4

SEX DIFFERENCES AMONG THE "D" STUDENTS: CHANGE IN PROBLEM-SOLVING STRATEGIES ACROSS THE FOUR "TEST" PROBLEMS

	PROBLEM-SOLVING STRATEGY*	FEMALES	MALES	1-TAILED SIGNIFICANCE OF SEX DIFFERENCES FROM MANN-WHITNEY U TESTS
PROBLEM 1	2	0%	14.3%	$\underline{P} = .42$
	1	70.0%	50.0%	
	0	30.0%	35.7%	
PROBLEM 2	2	0%	14.3%	$\underline{P} = .008$ (BOYS > GIRLS)
	1	40.0%	71.4%	
	0	60.0%	14.3%	
PROBLEM 3	2	10.0%	7.1%	$\underline{P} = .27$
	1	60.0%	78.6%	
	0	30.0%	14.3%	
PROBLEM 4	2	0%	0%	$\underline{P} = .08$ (BOYS > GIRLS)
	1	50.0%	78.6%	
	0	50.0%	21.4%	

* 2 = DIMENSION CHECKING (HIGHER LEVEL STRATEGY)
1 = HYPOTHESIS CHECKING (LOWER LEVEL STRATEGY)
0 = NO USEFUL STRATEGY